

Technical Comments on:

Tyson Foods, Inc.  
Grannis Processing Facility  
Grannis, Arkansas  
Copper Water Effects Ratio Study  
Revised April 18, 2016

These comments are being provided to the Arkansas Department of Environmental Quality (ADEQ) in response to the document titled *Tyson Foods, Inc. Grannis Processing Facility Grannis, Arkansas Copper Water Effects Ratio Study*. This study was intended to develop a WER value to be used in establishing site-specific criteria for copper for the unnamed tributary into which the Grannis Facility's effluent flows and for Rolling Fork River up to the point where its 7Q10 becomes greater than zero.

Technical Comments:

1. The LC50s were calculated in this report and the previous version of this report with the initial copper concentrations (both dissolved and total) rather than with the time weighted average concentrations that are recommended by the 1994 Interim Guidance. While the previous values were accurately calculated with those initial copper concentrations, the time weighted averages should be used for these calculations. Using the time weighted averages for the copper concentrations results in lower LC50s and in more conservative WERs. Below are tables summarizing the calculation of the LC50s using the time weighted averages using the Spearman-Kärber methodology.

## Event 1 - 7/5/11

### Laboratory Water Test (Hardness = 80)

Nominal Cu (ug/L)	Measured Total Cu (pre-test) (ug/L)	Measured Total Cu (post-test) (ug/L)	Time-Weighted Average (Total, ug/L)	% Loss	Measured Dissolved Cu (pre-test) (ug/L)	Measured Dissolved Cu (post-test) (ug/L)	Time-Weighted Average (Dissolved, ug/L)	% Loss	Mortality (n = 20)	EC50 (ug/L)
Control	1	1	1	0.00	1	1	1	0.00	0	Total = N/A
2.7	3.6	2.8	3.2	0.22	2.9	2.7	2.8	0.07	13	
4.1	5.7	4.6	5.15	0.19	5.2	4.8	5	0.08	15	
6.3	8.1	6.7	7.4	0.17	7.8	5.2	6.5	0.33	20	Dissolved = N/A
9.8	13	12	12.5	0.08	12	11	11.5	0.08	20	
15	20	14	17	0.30	12	13	12.5	-0.08	20	

\*Note - Lab water control copper concentrations (total and dissolved) were below the detection limit of 1 ug/L.

### Simulated Downstream Water Test (Hardness = 260)

Nominal Cu (ug/L)	Measured Total Cu (pre-test) (ug/L)	Measured Total Cu (post-test) (ug/L)	Time-Weighted Average (Total, ug/L)	% Loss	Measured Dissolved Cu (pre-test) (ug/L)	Measured Dissolved Cu (post-test) (ug/L)	Time-Weighted Average (Dissolved, ug/L)	% Loss	Mortality (n = 20)	EC50 (ug/L)
Control	5.1	4.4	4.75	0.14	5	4.4	4.7	0.12	0	Total = 155.9
54	56	50	53	0.11	55	49	52	0.11	0	
82	85	69	77	0.19	80	64	72	0.20	0	
127	140	100	120	0.29	120	95	107.5	0.21	1	Dissolved = 141.7
195	210	140	175	0.33	180	140	160	0.22	16	
300	310	300	305	0.03	280	290	285	-0.04	20	

## Event 2 - 9/6/11

### Laboratory Water Test (Hardness = 82)

Nominal Cu (ug/L)	Measured Total Cu (pre-test) (ug/L)	Measured Total Cu (post-test) (ug/L)	Time-Weighted Average (Total, ug/L)	% Loss	Measured Dissolved Cu (pre-test) (ug/L)	Measured Dissolved Cu (post-test) (ug/L)	Time-Weighted Average (Dissolved, ug/L)	% Loss	Mortality (n = 20)	EC50 (ug/L)
Control	1	1	1	0.00	1	1	1	0.00	0	Total = 6.3
2.7	2.8	2.6	2.7	0.07	2.5	2.3	2.4	0.08	0	
4.1	3.5	3.9	3.7	-0.11	3.4	3	3.2	0.12	2	
6.3	5.6	5.2	5.4	0.07	4.9	4.1	4.5	0.16	10	Dissolved = 5.4
9.8	10	12	11	-0.20	10	10	10	0.00	16	
15	16	13	14.5	0.19	15	9.5	12.25	0.37	20	

\*Note - Lab water control copper concentrations (total and dissolved) were below the detection limit of 1 ug/L.

### Simulated Downstream Water Test (Hardness = 190)

Nominal Cu (ug/L)	Measured Total Cu (pre-test) (ug/L)	Measured Total Cu (post-test) (ug/L)	Time-Weighted Average (Total, ug/L)	% Loss	Measured Dissolved Cu (pre-test) (ug/L)	Measured Dissolved Cu (post-test) (ug/L)	Time-Weighted Average (Dissolved, ug/L)	% Loss	Mortality (n = 20)	EC50 (ug/L)
Control	8.1	1.4	4.75	0.83	8.1	1.2	4.65	0.85	0	Total = 212.2
54	57	50	53.5	0.12	55	42	48.5	0.24	0	
82	87	73	80	0.16	80	65	72.5	0.19	0	
127	130	110	120	0.15	120	94	107	0.22	0	Dissolved = 192.9
195	190	160	175	0.16	180	150	165	0.17	2	
300	300	260	280	0.13	260	230	245	0.12	20	

With these values and using the SMAVs (all corrected for hardness), the final WER for total copper is 3.5709 and for dissolved copper is 3.5233. Using the more conservative WER (dissolved) the chronic criteria would be 14.7009 µg/L and the acute criteria would be 19.8871 µg/L. EPA recommends using these time weighted copper concentrations and the more conservative WER that results from them for determining the site specific criteria.

2. In response to EPA's previous comment requesting verification of hardness and alkalinity values for the site water and lab water used in the September 2011 tests, GBMc has referred to American Interplex Corporation Laboratory's Control No. 150846-1 page 3 of 8 and Laboratory Control No. 150846-2 Page 1 of 5. While this information is listed here, these pages appear to be a summary of the results, rather than the actual results from the tests as are displayed, for example, on Control No. 150847 Page 3 of 7, titled "Analytical Results". For the first study conducted in July 2011, all of the information in these summaries could be verified with an "Analytical Results" page. Is there one of these available that can verify the information for the second WER. Also, what water was being tested for the results displayed on Control No. 150845 if not the water utilized for the WER test study? This verification of these values will be needed to confirm that the WER is correct.

3. In ADEQ's review of the WER there was a question about whether the WER can be applied to both the unnamed tributary and also Rolling Fork River. After reviewing the 1994 EPA document, *Interim Guidance on Determination and Use of Water-Effect Ratios for Metals* Appendix A Part C. Definition of Site, it appears that the WER can be applied to both of these water bodies since both would be 100% effluent under 7Q10 conditions, and this was the condition tested with the WER. This is a preliminary assessment about the appropriateness of the location of the application of the WER. EPA will continue to review this case further in order to confirm the appropriate location to apply the WER.

4. On page 1, the caption for table 1 states that these are the permit limits for copper and zinc, but they are only for copper.

5. On page 7 the report refers to the conditions that must be met in order for a WER test to be acceptable. While it is noted that WER -1 did not meet the condition of one treatment other than the control having less than 50% mortality, it is not pointed out that the control for the SWM in WER-2 did have greater than a 50% loss of dissolved copper between initial and final measurements. This loss, and why the WER values are still valid needs to be addressed in the report.

6. On page 11, the report states that the lab water LC50s and SMAVs were normalized to the site water mix hardness. I believe, looking at the table provided, that they were actually normalized to the hardness of the lab water. This is also what is stated in the work plan. This does not impact the WER calculation, as everything was normalized to one hardness, but it should be revised for clarity.

7. On page 13 there is a typo in the acute criteria formula. E should be raised to  $.9422\ln(31) - 1.464$ .

8. On page 13 there also appears to be a typo in statement 4. It states that “the water quality management plan be amended with the new copper permit limits for Tyson Foods Nashville” rather than Tyson Foods Grannis.